CLAIMS

What we claim is:

1. A process for the production of an electrolytic electrode having an electrocatalytic coating thereon, said electrocatalytic coating having a surface morphology adapted for enhanced electrode efficiency, said process comprising the steps of:

providing a valve metal electrode base;

coating said valve metal electrode base with a coating layer of an electrochemically active coating on said valve metal electrode base, said coating consisting essentially of a mixture of ruthenium oxide, titanium oxide and one or more of tin oxides or antimony oxides, said mixture providing from at least about 10 mole percent up to about 30 mole percent ruthenium, and at least about 50 mole percent up to about 85 mole percent titanium, basis 100 mole percent of the metal content in the coating, wherein said surface morphology of said coating is characterized by minimal mudcracks, and wherein said electrode produces less than about 2.0% oxygen in a chlorate electrolyte.

2. The process of claim 1, wherein said valve metal electrode base is one or more of titanium, tantalum, zirconium, niobium, tungsten, aluminum, their alloys and intermetallic mixtures, and said base is in mesh, sheet, blade, tube or wire form.

3. The process of claim 1, wherein a surface of said valve metal electrode base is a prepared surface.

4. The process according to claim 3, wherein said surface is prepared as by one or more of etching, intergranlular etching, grit blasting, or thermal spraying.

5. The process of claim 2, wherein said ruthenium oxide is present in an amount from about 10 mole percent up to about 25 mole

percent, and said titanium is present in an amount from about 60 mole percent up to about 75 mole percent, basis 100 mole percent of the metal content of the coating.

6. The process of claim 1, wherein said coating contains from about 5 mole percent up to about 20 mole percent antimony oxide basis 100 mole percent of the metal content of the coating.

7. The process of claim 1, wherein said coating contains from about 2 mole percent up to about 20 mole percent tin oxide, basis 100 mole percent of the metal content of the coating.

8. The process of claim 5, wherein said coating contains from about 10 mole percent up to about 15 mole percent antimony oxide and from about 2 mole percent up to about 15 mole percent tin oxide, basis 100 mole percent of the metal content of the coating.

9. The process of claim 1, wherein the ratio of ruthenium metal to antimony or tin is from about 2:1 to about 0.1:1 and the ratio of titanium metal to antimony or tin is from about 19:1 to about 1:1.

10. The process of claim 1, wherein said surface morphology of said coating provides, as measured by scanning electron microscopy, from about less than or equal to 16,000 platelets/mm^2.

11. The process of claim 10, wherein said surface morphology of said coating provides, as measured by scanning electron microscopy, from about 100 to about 12,000 platelets/mm^2.

12. The process of claim 1, wherein said coating is a water-based coating.

13. The process of claim 1, wherein said electrode is an anode in an electrolytic process for the production chlorate.

14. The process according to claim 1, wherein said process further comprises the step of heating said coating and said heating is by baking at a temperature of from about 425°C to about 525°C for a time of from about 3 minutes up to about 20 minutes.

15. The process of claim 1, wherein said coating composition further includes iridium oxide in an amount from about 1 mole percent up to about 25 mole percent, basis 100 mole percent of the metal content of the coating, and the ratio of ruthenium metal to iridium is from about 1:1 to about 99:1.

16. A metal article of a valve metal substrate for use in electrocatalytic processes, said valve metal substrate having an electrocatalytic surface coating thereon, wherein said coating consists essentially of a mixture of ruthenium oxide, titanium oxide and one or more of tin oxides or antimony oxides, said mixture providing from at least about 10 mole percent up to about 30 mole percent ruthenium, and at least about 50 mole percent up to about 85 mole percent titanium, basis 100 mole percent of the metal content in the coating, wherein said surface morphology of said coating is characterized by minimal mudcracks.

17. The metal article of claim 16, wherein said valve metal substrate is one or more of titanium, tantalum, zirconium, niobium, tungsten, aluminum, their alloys and intermetallic mixtures, and said substrate is in mesh, sheet, blade, tube or wire form.

18. The metal article of claim 16, wherein a surface of said valve metal electrode base is a prepared surface.

19. The metal article of claim 18, wherein said surface is prepared as by one or more of etching, intergranlular etching, grit blasting, or thermal spraying.

20. The metal article of claim 17, wherein said ruthenium oxide is present in an amount from about 10 mole percent up to about 25 mole percent, and said titanium is present in an amount from about 60 mole percent up to about 75 mole percent, basis 100 mole percent of the metal content of the coating.

21. The metal article of claim 16, wherein said coating contains from about 5 mole percent up to about 20 mole percent antimony oxide basis 100 mole percent of the metal content of the coating.

22. The metal article of claim 16, wherein said coating contains from about 2 mole percent up to about 20 mole percent tin oxide, basis 100 mole percent of the metal content of the coating.

23. . The metal article of claim 16, wherein said coating contains from about 10 mole percent up to about 15 mole percent antimony oxide and from about 2 mole percent up to about 15 mole percent tin oxide, basis 100 mole percent of the metal content of the coating.

24. The metal article of claim 16, wherein the ratio of ruthenium metal to antimony or tin is from about 2:1 to about 0.1:1 and the ratio of titanium to antimony or tin is from about 19:1 to about 1:1.

25. The metal article of claim 16, wherein said surface morphology of said coating provides, as measured by scanning electron microscopy, from about less than or equal to 16,000 platelets/mm^2.

26. The metal article of claim 25, wherein said surface morphology of said coating provides, as measured by scanning electron microscopy, from about 100 to about 12,000 platelets/mm^2.

27. The metal article of claim 16, wherein said coating is a water-based coating.

28. The metal article of claim 16, wherein said electrode is an anode in an electrolytic process for the production of one or more of chlorine, chlorate, hypochlorite, or for the oxidation of a soluble species.

29. The metal article of claim 16, wherein said coating further includes iridium oxide in an amount from about 1 mole percent to about 25 mole percent, basis 100 mole percent of the metal content of the coating, and the ratio of ruthenium metal to iridium is from about 1:1 to about 99:1.